

We also enclose typical performance curves for Engelhard's Camet oxidation catalyst. There are three important points to note about these curves. First, these curves report the oxidation of SO_2 to SO_3 as a function of gas temperature, not of SO_2 to SO_4 . Any SO_3 that is formed across the catalyst would have to combine with moisture in the stack gas to form H_2SO_4 and then with ammonia to form ammonium sulfite and ammonium bisulfite. Second, the curves illustrate typical oxidation catalyst performance at relatively low space velocities of 100,000 and 200,000 per hour. In reviewing the list of installations, most CO catalysts are provided with space velocities substantially above 200,000 per hour. These curves show that the percent oxidation decreases as the space velocity increases. For the types of installations being considered in California, space velocities would be very high and SO_2 oxidation very low. Third, the percent oxidation depends on the gas temperature. The list of installations show that most CO catalysts on combined cycle plants are installed in the lower temperature range (600-650 F), typically upstream of the SCR catalyst in the HRSG. Very little if any SO_2 is oxidized at these temperatures.

The scientific basis for claiming that CO catalyst increase particulate matter is simply not supported by science. Most natural gas fired turbines have very low levels of SO_2 emissions. Although a portion of this SO_2 will be converted to SO_3 across the oxidation catalyst, the amount of SO_3 formed is extremely small. For this small level of SO_3 to contribute to particulate matter in the stack, it will have to react with ammonia and condense. Condensation will only occur if the dew point of ammonia reaction products is above the exhaust temperature at the stack. The dew point of sulfate reaction products is about 120 F. This is well below the temperature in the stack of a combined cycle power plant and very close to ambient conditions in many locations. Therefore, the oxidation of SO_2 to SO_3 will not form particulate matter that can be detected in the gas turbine exhaust. This theoretical basis is confirmed by numerous source tests which indicate clearly that particulate matter concentrations in exhaust gases from units with CO catalysts are very low, typically much lower than 0.001 gr/dscf, and comparable to units with no controls at all and units with SCR only.

The very low particulate emissions, if any, from CO catalysts, can be substantially reduced by simple design considerations. The oxidation catalyst can be located in the lower temperature region of the HRSG, upstream of the SCR, to reduce the oxidation of SO_2 . Because sulfate salt formation is a function of both SO_3 and NH_3 concentrations, formation can be reduced by lowering the allowable ammonia slip from the 10 to 20 ppm typical of many installations to 2 ppm with no loss in performance of the SCR system. Lower concentrations for both reduces the dew point temperature.